Column 440

Yukon Science Institute celebrates 20th anniversary with 'lights show'

by Erling Friis-Baastad

In February 1987, space physicist Dr. Gordon Rostoker of the University of Alberta was the very first speaker in the Yukon Science Institute lecture series.

His topic, appropriately enough, was the northern lights.

"It was quite a surprise when I discovered no one had been up there to give talks on the northern lights, but you'd get them up in your neck of the woods virtually every night if the clouds weren't there," he said from Edmonton last week.

Scientific knowledge of the northern lights has advanced considerably since Dr. Gordon Rostoker delivered his first YSI lecture in 1987. (photo courtesy NOAA Photo Library)

Rostoker will be returning to the Yukon this month to help celebrate the 20th anniversary of the Yukon Science Institute with another lecture on the aurora borealis.

However, while he has continued to labour in the same space physics vineyard since he was last here, we shouldn't expect a repeat of his first Yukon presentation. A whole lot has been happened in his field since.

"Just around the time when I gave my talk back in Whitehorse back in 1987, we had just finished one of the first really great satellite experiments: observing and photographing the northern lights from above.

"We had a field day, an enormous wealth of observations. It answered a lot of questions, but as usual the more questions you answer the more you seem to find. Life has been just trying to improve on what that one great satellite experiment did for us back in the 1980s."

Satellites and their companion computers have changed his field in many ways. You don't even want to try and imagine just how many, he says.

For one -- very major -- thing, scientists can now see the aurora globally. Before satellites, observers were "really in a pickle," he recalls. All they could see was an

area of perhaps 1,000 kilometres from horizon to horizon.

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"The world's a lot bigger than that."

As well, "you really need a satellite outside the Earth's environment to see the energy coming at you, to give you an opportunity to predict what's going to happen down the line."

Scientists were granted that new perspective "back in 1999 when the ACE satellite was sent up." That space craft sits about a million and a half kilometres away, between the earth and the sun.

By going to the U.S. government's National Oceanic and Atmospheric Administration's web site, anyone and bring up real-time data about solar winds, before they reach us and energize the aurora borealis.

"So if you're in Whitehorse and want to check out if there's going to be some good northern lights, you can go to www.sec.noaa.gov, click on 'ACE Real-Time Solar Wind.'"

"When I give my lecture up there, I'll tell you guys how to interpret that information."

While satellites have expanded the space scientists' field of view, the computers have managed to shrink the work space: literally. Rostoker used to spend much of his time attending ground-based equipment in the Canadian North.

"Have I been up north recently? The answer is, no. Have I operated equipment in the North? Oh, boy, have I ever, mainly on behalf of the Canadian Space Agency, which has run a network of magnetometers for many, many years, and continues to, all across North America."

Equipment in the field beams data up to a satellite, which beams it all back to a central computer.

"You don't need a human being on the site anymore. It has amazed me that I can do most of my research at home. I don't even have to go into the university. I can reach into various web sites and hit various data streams.

"All analytical data tools are right on the computer that's sitting in front of me at this moment."

Of course, if this branch of research were only about trying to predict the most awe-inspiring displays of northern lights, it probably would not have progressed very far. All that horizon-expanding, time-saving equipment is expensive.

However, not having advance data about solar wind would be far more costly, which is why governments and military branches around the world are keen to support this branch of space science.

What really has attracted people's attention to the impact of the solar wind is the fate

of communications satellites, says Rostoker. "These satellites are occasionally impacted by very energetic particles that are created in the same process that ultimately leads to northern lights.

"And some of these energetic particles, when they hit a satellite, will build up a space charge. Some part of the satellite will become electrically charged... and if it gets too big as a space charge it will eventually discharge.

"If there are any components in the way: goodbye."

These vulnerable satellites -- on which depend all those services we take for granted, like our friendly neighborhood ATM, the GPS we take into the wilderness, cell phones and pagers, weather satellites, etc., etc. -- "cost about $300 million to $400 million a pop," says Rostoker.

Being forewarned is being forearmed. A message about approaching solar wind detected by a satellite a million and a half kilometres away will reach us before the wind, because the satellite's transmission travels much faster, at the speed of light. It gets here about 50 minutes before the solar wind arrives.

It is possible to protect a satellite. "You can power down equipment; equipment powered up is more vulnerable," Rostoker says.

The physicist warns that we're still quite unprepared for the, "the big outlier event," that is the equivalent of a category-5 hurricane.

"We find time and again that nature surprises us with the perfect storm," he says.

Gordon Rostoker will be presenting his lecture *Violence in the Sky: The Northern Lights* at 7:00 p.m. at the Westmark Whitehorse on September 18 and again at the Dawson City Museum on September 19 at 7:30 p.m.

For more information go to www.taiga.net/ysi.